

MAINTENANCE NOTE 55 (for Electronics Technicians)

Systems Evaluation Branch

W/OSO12: SR/OSO12

Emergency Managers Weather Information Network (EMWIN) Downlink Installation Technical Information Package (TIP).

NOTE: This TIP addresses the initial installation of the EMWIN system kit. Implementing this TIP requires users to understand that the placement of the receiving dish is not final. The final location is determined by each Weather Forecast Office (WFO). Final dish type and size is also determined by each WFO.

GENERAL. This TIP provides information needed by the National Weather Service technician(s) to install the EMWIN downlink system and configure the system for reception of the data stream from either Geostationary Operational Environmental Satellite (GOES)-8 (East satellite) or GOES-10 (West satellite). The intended use of this system is for verifying warnings and watches sent by the particular WFO.

This TIP consists of assembling the antenna dish, pointing properly to the selected satellite, and peaking the signal using the GOES receiver. A basic guideline is provided for monitoring the data stream for watches/warnings.

This TIP is issued to all holders of Engineering Handbook No. 7 (EHB-7).

EFFECT ON OTHER INSTRUCTIONS. None.

PROCEDURE. Contained within the TIP.

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1. INSTALLATION OVERVIEW

EMWIN has a rich data stream with over 10,000 products. To lock-on this data stream, it is necessary to use the pointing angles generated by the tuning software, a compass to get an estimated azimuth reading, and a protractor to estimate the elevation angle from the horizon to the satellite. In general, the antenna dish points in a southerly direction. The elevation angle increases in proportion to the nearness of the WFO to the equator.

After the antenna dish is pointed, it is necessary to peak and polarize the signal by aligning the feed to the signal. (The GOES data signal is linearly polarized, so to get the best possible signal, the feed must be aligned with this signal.) It is possible that the receiver can be locked on the signal but the feed not fully aligned. This causes dropouts or random dropouts that make the system ineffective for monitoring purposes. These instructions guide the installer to use the software to the final checks on the signal for proper alignment.

The EMWIN is a [Commercial-off-the-shelf (COTS)] system. It consists of a personal computer (PC), monitor, keyboard, GOES receiver with associated cables, and antenna dish with low noise amplifier (LNA).

1.1 Site Coordination

The system may be installed as soon as it arrives. Installation should not impact any current operations. It is up to the electronics staff to schedule an installation time, not to exceed thirty days after arrival. A WS Form A-26 must be completed and submitted when installation is complete.

1.2 Telephone Requirement

Telephone paging is a site determined option. See *RealEMWIN* and *Cpager 95* manuals for paging setup. A 56 kilobyte (kB) modem is built into the system for this purpose.

1.3 Grounding Requirements

The EMWIN system has no special grounding requirements beyond general connection practices and site requirements. The antenna and LNA get both power and ground (GND) from the satellite receiver via the RF cable.

1.4 Physical Location

The installation of an EMWIN system requires a location allowing a clear Southern view from the antenna dish to the selected satellite. If a ground mount is provided, an out-of-the-way position is preferred. There can be no trees or traffic blocking the signal.

The connection between the LNA and receiver is ideally 200 feet. If the distance is less than 150 feet, the supplied attenuator/splitter must be used. If the distance is over 200 feet (at a maximum of 1000 feet) an L-band in-line amplifier, must be installed at least 75 feet away from the receiver. Route the RF cable through a conduit.

Locate the receiver so the RS-232 serial cable reaches the PC communication (comm) port connector and allows the signal meter to be monitored by the EMWIN operator. Ideally, the receiver should be next to the PC at a location so the signal strength meter can be monitored.

2. INSTALLATION OUTLINE

2.1 Equipment Required

The following equipment and supplies are required to install and check out the EMWIN system.

- A COTS EMWIN kit (the contents of this kit are listed in Table 1). This kit will arrive as per delivery schedule. After the warranty period, limited spares will be available from the National Logistics Supply Center (NLSC) for replacement actions by NWS maintenance staff.

Table 1 COTS EMWIN Kit

Product Description	Part Number	Vendor Name *	Agency Stock Number *
GOES Receiver			
Receiver	WX-13/DH3		
Power Supply Cable Ferrite Assembly	Zephyrus made in-house 623-0444167281		
PC and keyboard 15 inch Monitor	Advanced PC Pentium III Septre Dragon D51		
LNF and Mounting Hardware			
LNA and Feedhorn assembly Clamp and ring mount	WX-INF Local Manufacture/Vendors		
3 foot Dish Package			
3 foot Panarex Ring Mount	900R		
or			
3 foot Panarex Universal Mount	900U		
Cabling			
75 feet of RG-6 coaxial cable W/connector	9114 010*75F		
Assembly Accessories Package			
Waterproof coax sealing tape	COAX-SEAL		
5/32 inch Allen wrench	86719/CHESCO		
Splitter Assembly splitter 75Ω Terminator Installed in DC blocked output 3 foot RG-6 cable w/connector DB-9 data cable In-line amplifier	SSP-21P/HFS-2 F-59T 9114 010-3F 9MF-6-A LA 915		

Product Description	Part Number	Vendor Name *	Agency Stock Number *
Documentation			
Software backups Software users manuals Weathernode RealEMWIN Digital Atmosphere Spinning hat Cpager95 Zephyrus additional information	Local copy Local printing Local printing		

* To be assigned.

- A compass and protractor for estimating azimuth and elevation angle.
- Appropriate Phillips and slotted-head screwdrivers (Allen wrench included with kit).
- Two adjustable crescent wrenches.
- This TIP.
- Multi-meter.

NOTE: RG-6 cable is recommended. The use of RG-59 cable is not guaranteed to work due to sheilding.

2.2 Safety Precautions

Routine safety procedures should be used in installation and maintenance of EMWIN systems.

- Always exit all software in an orderly manner before powering down the PC.
- Once per month defragment the hard drive.
- Use caution when handling cables, connectors, or terminals; they may yield hazardous currents if inadvertently brought into contact with conductive materials, including water and personnel.
- Do not install the receiver during precipitation.

CAUTION

The LNA is powered from the Receiver power source!

2.3 Installation Steps

Section 3 contains a full description for each EMWIN system installation step. These steps assume that the EMWIN PC, receiver and LNA are fully functional. Installing the EMWIN system involves the following steps:

- a. EMWIN PC Pretest
- b. Assemble the antenna unit and base.
- c. Connect the RF cable and waterproof the connection.
- d. Point and tune for maximum signal.
- e. Configure the system for monitoring.

3. INSTALLATION INSTRUCTIONS

3.1 EMWIN PC Pretest

This is only an initial power test and system check. At this time, no EMWIN software is enabled. Use the following steps to setup the PC and power-up:

- a. Connect Keyboard, mouse, and monitor to the EMWIN PC.
- b. Power-up in a normal fashion. All Windows software should come up as any Windows 98 system. If this is not the case, notify Advanced PC Products, 972-241-2774. Refer to contract number 50DDNW-0-9001, and have the computer serial number ready.
- c. Double click the tuning software icon labeled **Satellite Locate**. A prompt to enter Earth Station Latitude displays.
- d. Enter the latitude for the WFO. The Latitude and Longitudes are provided in attachment A for ground station positions, if needed.
- e. Follow the prompts to generate pointing angles for both GOES-8 and GOES 10.
- f. Log the angles on the Blank Sheet of this TIP for future reference.
- g. Bring the system to an orderly shut down and proceed with the installation.

3.2 Mount Assembly

The antenna assembly and installation entail mounting the antenna reflector on either a ring mount or pole mount.

Ring Mount Assembly

- a. Connect the ring mount to the bottom portion of the reflector using the hinges on the ring mount.
 - (1) Locate the hinges on the ring mount and the matching hinge parts for the reflector.

- (2) Attach the reflector with the back of the reflector facing the ring mount.
 - (3) Assemble the hinges to allow free movement in a vertical axis. (Refer to Ring mount Assembly, **Figure 1**).
- b. Fasten the rear dish support leg to the reflector and the ring mount by doing the following:
- (1) Attach the support leg with the pole locking mechanism towards the reflector (see **Figure 1**).
 - (2) Attach the other end of the support leg to the ring mount.



Figure 1 Ring Mount Assembly

Universal Pole Mount Assembly

NOTE: The vertical pole must be provided by the WFO (Refer to section 1.4).

- a. Install a 1.75 inch outside diameter pipe in a cement base in the installation location. The height of the pipe is site determined in order to provide clear, unobstructed Southern view of the satellite.
- b. Locate the pole mount assembly depicted in three views (**Figure 2** through **Figure 4**).
- c. Check for paint over-runs in the pole adapter before attaching the reflector. If paint is in the screw holes, clear out the paint by running in the countersink screws from the opposite direction.
- c. Secure the pole mount adaptor to the reflector with four countersink heavy duty screws and plastic spacers.



Figure 2 Pole Mount Assembly

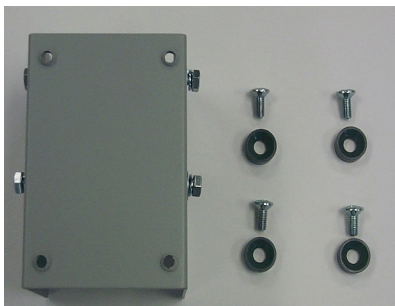


Figure 4 Pole Mount Assembly



Figure 3 Pole Mount Assembly

3.3 Reflector Mounting Ring Assembly

- a. Attach the LNA mounting ring assembly (see **Figure 5**) to the reflector ensuring the assembly is tightened securely.
- b. Attach the LNA unit to the mounting ring assembly leaving it loose enough to allow rotation of the LNA assembly.

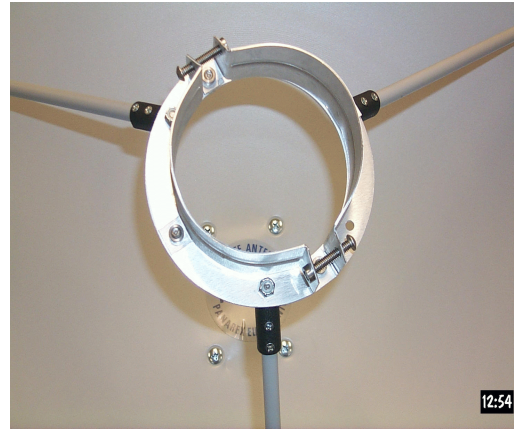


Figure 5 LNA Mounting Ring Assembly

3.4 RF Cable Connection

The RF cable routes power to the LNA from the receiver. The RF cable is standard RG-6 cable, but it supplies operating voltage and GND to the LNA and allows transmission of the EMWIN signal from the LNA to the receiver. The GND supplied ground from the receiver originates from the building electrical system via the cable shield. The center conductor is for the LNA DATA signal.

- a. Test the cable for no shorts between the center conductor and the shield with a multimeter.

CAUTION

Remove power from the Receiver prior to disconnecting or connecting cable to the LNA.

- b. If OK, connect to the LNA.
- c. Waterproof the cable with waterproof tape. Water entering the cable at this connection can cause the signal to short out and possibly damage the power supply in the satellite receiver.

3.5 Antenna Point and Tune for Maximum Signal

Ideally, the receiver should be close to the antenna during this portion of the installation.

- a. Position the receiver near the antenna staging area and prepare to point the antenna by doing the following:
 - (1) Run a power extension cable to power the receiver.
 - (2) Connect the RF cable to the back of the receiver to a jack labeled LNF (low noise feed).

NOTE: If 75 foot cable is used for tuning, connect the attenuator/splitter to the receiver.

- (3) Connect the 24 volts-alternating current (VAC) plug to the 24 VAC jack of the receiver.
- (4) Plug in the power supply to power up the receiver.
- (5) Point the antenna feed to the angle logged on the blank sheet and compare to attachment B. If not close to the same angles, it is possible that the wrong pointing angles were generated due to an error.

NOTE: Use a compass if necessary for orientation.

- (6) Use the protractor, when doing pole mount installation, to get an approximate elevation angle.
 - (7) Position the antenna, when doing ring mount installation, to elevation angle logged on the blank sheet.
 - (8) Lock down (only hand tight) the elevation rod to the elevation angle using the markings on the rod.
- b. In a non-noisy environment, use the tone generated by the receiver to lock on the signal:
- (1) Locate the Speaker slide switch on the back of the receiver and set to "tone" position.
 - (2) Adjust tone pitch pot for maximum clarity.
 - (3) Point the antenna to achieve the highest pitch tone, moving both the azimuth and the elevation to accomplish this.
 - (4) Set the tone switch to the OFF position when done.

CAUTION

Failure to set the tone switch to OFF will induce errors in the received data.

Or

- c. In a noisy environment, use the meter located in the front of the receiver to lock on the signal:
- (1) Set the meter switch to the "Peak Dish" position.
 - (2) Adjust the center meter pot to mid-range on the meter.
 - (3) Peak the reflecting dish for maximum, re-centering the meter at the peak of signal.

- (4) Place the switch to monitor position when satisfied the signal is at the highest level.
- (5) If the meter goes full scale in monitor position, adjust tone pitch pot to midrange and repeat steps 1 to 4.
- d. Rotate the feed to align with the correct polarity of the satellite signal and adjust for peak on the signal meter or tone.
- e. Center the meter again.
- f. Set the slide switch to the “monitor” position.
- g. Lock down elevation and azimuth on the mount using one of the following:
For the ground ring mount, place weights (sandbags or cinder blocks) on the ring mount to prevent movement of the dish assembly.
Or
For the Pole Mount, tighten down all bolts to prevent movement.
- h. Recheck the signal meter to ensure the antenna has not moved off signal while tightening. If it has moved, re-peak the antenna by only moving the antenna.

NOTE: With an indelible felt tip marker, make an index mark to note the position of the feed housing on the mounting ring for future reference. The phasing polarity of GOES-East and GOES-West EMWIN signal is approximately 50 degrees apart. To switch to the other satellite for reception, the polarity is off by 50 degrees. The index mark is a quick reference for aligning the feed. See attachment B for feed position at different ground station locations.

- i. Power down the receiver and disconnect from the feed.
- j. Place the receiver at the designated location near the EMWIN PC within the WFO and route the RF cable to that location making connection again.
- k. Connect RS-232 cable to the PC comm port. Make connection between the plug labeled “EMWIN Data to Computer” and the PC comm port. Ensure all connecting screws are tightened.
- l. Power up the receiver by plugging in the 24 VAC power supply to the alternating current power.

3.6 EMWIN Engine Configuration for Bitstream Quality Guidelines

- a. Power up the PC and wait for the Windows operating system to come completely up to normal environment. Proceed with the following setup guidelines. If the user is already familiar with EMWIN and wishes to use their own method for monitoring, skip this portion of the TIP.

- (1) Double click on the Weathernode 4.0 EZ icon (it looks like a small cloud with rain falling from the cloud). A small work bar displays on the monitor screen usually towards the top left area of the screen.
- (2) Select **Modules**. A small window displays from the work bar with several options to select.
- (3) Select the **EMWIN Engine** option. A graphical window representing the EMWIN ingest engine displays (see **Figure 6**). The EMWIN Engine window is very useful in monitoring data quality and proper operation of data stream reception.
- (4) Configure the System Configuration box by clicking the mouse on the following values:

COMM PORT:	1
Baud Rate:	9600
Beep:	No
Log Errors:	No
Start Window:	Normal
Minimize to:	Statbar

- (5) Check the **Monitor Blocks** box.
- b. Click on the last box to the right at the upper left of the window where four boxes display to toggle between **Ck. File** and **Show Receive**.
 - c. Select **Show Receive**. This allows the EMWIN engine software to monitor the data, block by block, as it is received. Red are blocks not received, yellow are blocks with data errors, green are perfect blocks. There is also a received data bar scrolling to the right representing the data being received. An antenna system properly pointed and connected to a receiver fully operational displays no yellow blocks. The goal is to have receiver signal meter centered and peaked and no yellow blocks on the EMWIN engine. If this is not the case, something is wrong. See the troubleshooting section of this TIP. The EMWIN engine should also display 100% data quality and the blocks received good should equal the blocks received. You can also reset the block count to restart the data quality percentage calculations by clicking the **Reset Counter** button.
 - d. Monitor data quality using the EMWIN Engine window, **Figure 6**.

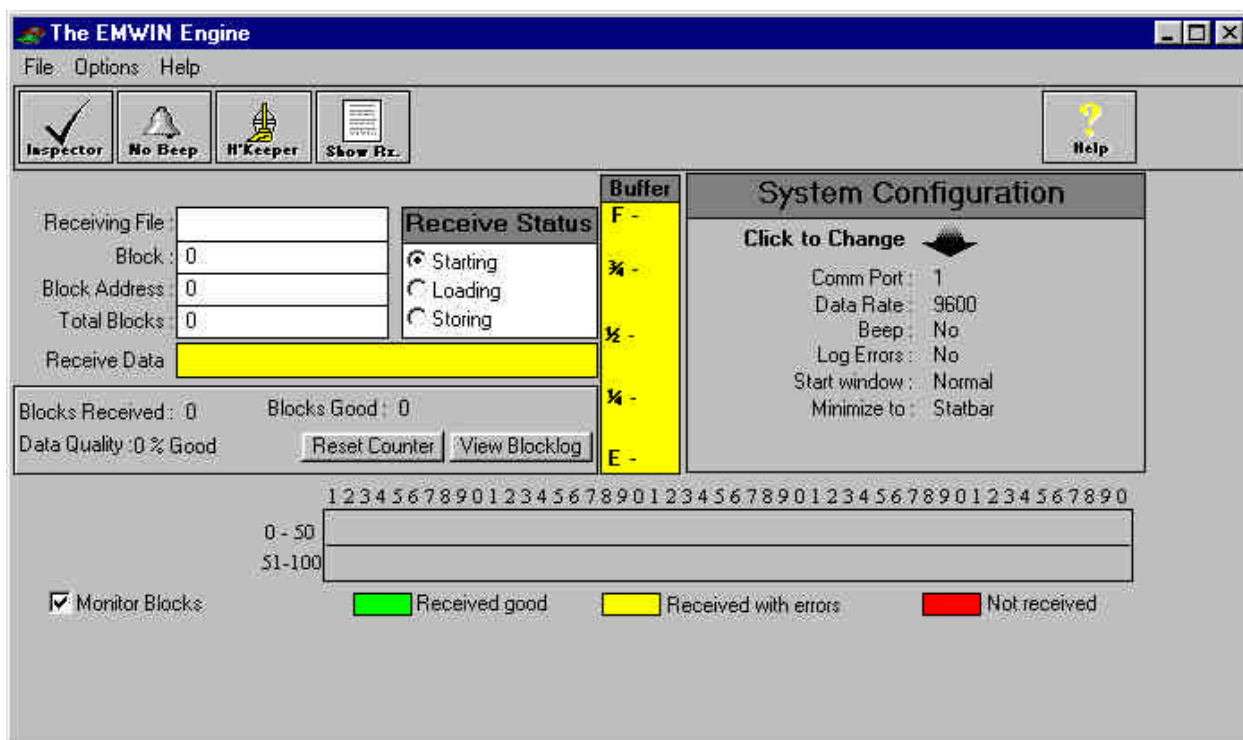


Figure 6 EMWIN Engine

- e. Close the EMWIN engine after you are satisfied the data stream is being received properly and then close Weathernode 4.0. If Weathernode 4.0 is left running, RealEMWIN will not start up properly.

3.7 RealEMWIN System Configuration

The RealEMWIN software is the best way to know if a warning/watch product has been sent by the WFO. The reception of the product by EMWIN proves that the warning/watch was sent to the National Weather Service Telecommunications Gateway (NWSTG) and or Weather Wire. The EMWIN system processes both the Weather Wire and NWSTG warning/watch products as priority one products. These products are transmitted as soon as they are received, providing there are no other priority one products ahead in the EMWIN transmit queue. EMWIN transmits both the Weather Wire and the NWSTG product even if they are the same, so both products should be received. The body and headers of the messages are identical. The warning/watch received first typically is the one from the Weather Wire due to propagation time of Weather Wire being much less than the NWSTG. The EMWIN transmitting system processes the warning/watch product in less than 15 seconds.

- a. Ensure Weathernode 4.0 is not running.
- b. Locate the RealEMWIN icon and double-click on it. The RealEMWIN Operational window displays.
- c. Select **File** and click on **CONFIGURATION**. The Configuration window displays (see **Figure 7**).

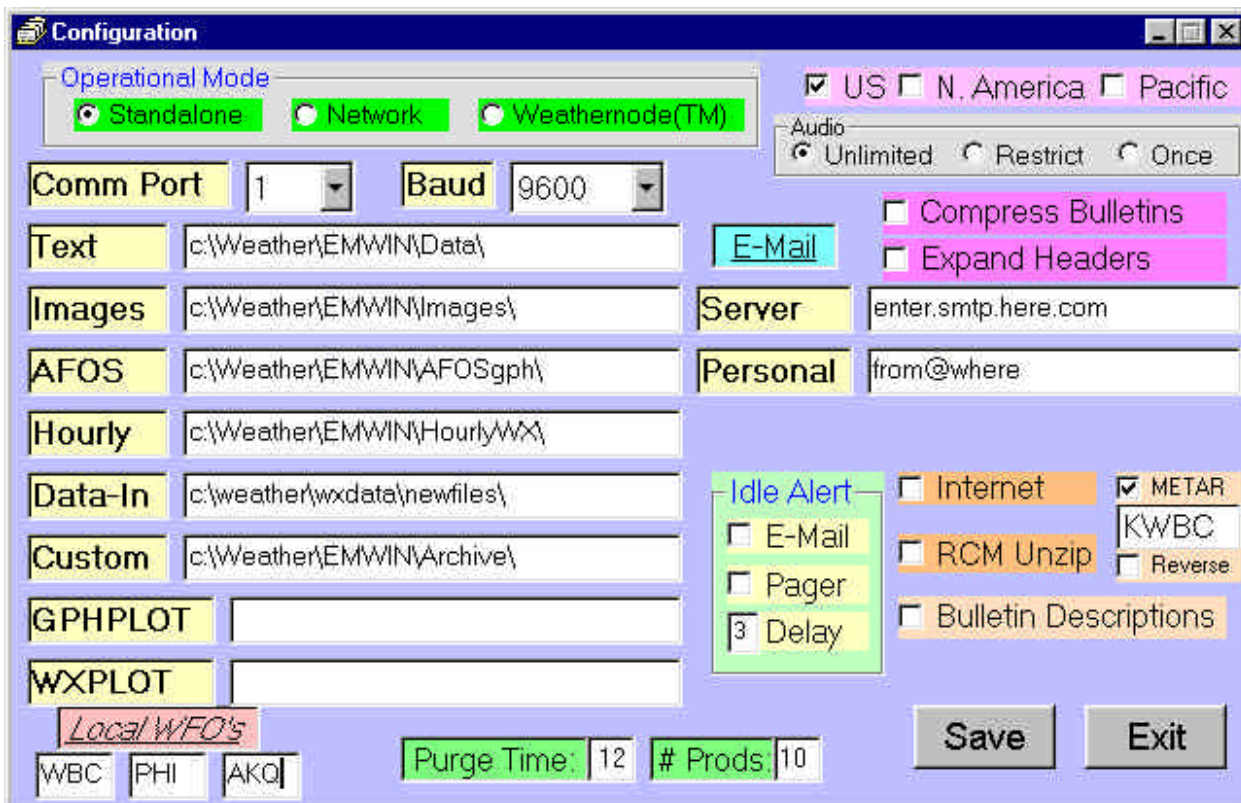


Figure 7 RealEMWIN System Configuration Window

- d. Enable the following by clicking in the appropriate areas:
- | | |
|------------------|---|
| Operational mode | Standalone |
| | US |
| Audio | Unlimited |
| COMM PORT | 1 |
| Baud | 9600 |
| METAR | (enter local METAR code) |
| LOCAL WFO's | (enter up to three WFO site identifiers) |
| Purge Time | 12 |
| # Prods | 10 |
- e. Click on **SAVE** to close out the configuration window. The RealEMWIN Operational window redisplay with a light blue area posting status messages (see **Figure 8**). If all is OK, product headers post in this same status area. If this does not occur, go to the troubleshooting section of this TIP.

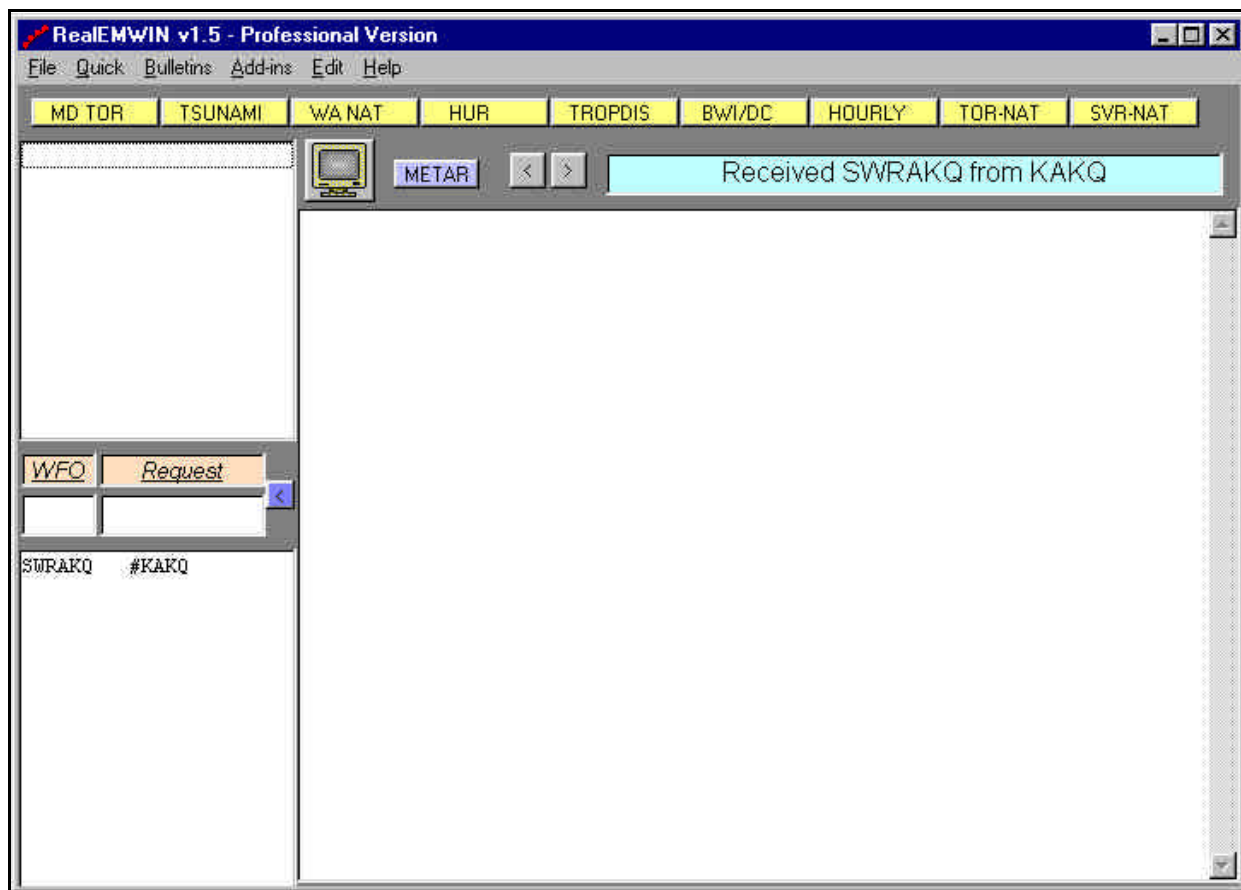


Figure 8 RealEMWIN Operational Window With Status Message

3.8 Alarm Settings Guidelines

Alarms are another way of using system features to let you know a critical product has been sent. In the following setup, the system is configured to log and scroll products as soon as the system receives them:

- a. Click on **File** in the RealEMWIN window and select **Alarm Settings** (see **Figure 9**).

PRODUCT	Zone	Prnt	Dis	Scr	Audio	E-mail	Pager	EXE	Time	Log	Cmp	Cus
FEEDBACK		No	No	No	None	None	None	0	All	Yes	No	No
TORWBCMD		No	No	Yes	None	None	None	0	All	No	No	No
TSU		No	No	Yes	None	None	None	0	All	No	No	No
SVR		No	No	Yes	None	None	None	0	All	No	No	No
HLS		No	No	Yes	None	None	None	0	All	No	No	No
TCD		No	No	No	None	None	None	0	All	No	Yes	No
SEL		No	No	Yes	None	None	None	0	All	No	No	No

Product: [] State: [] County: [] EMail: [None] Alert: [None] Pager: []

Print [] Display [] Custom [] Scroll [] Compress [] Log []

Time Range: 7 22 Time [] EXE []

Buttons: Add, Exit, Sort Alarms

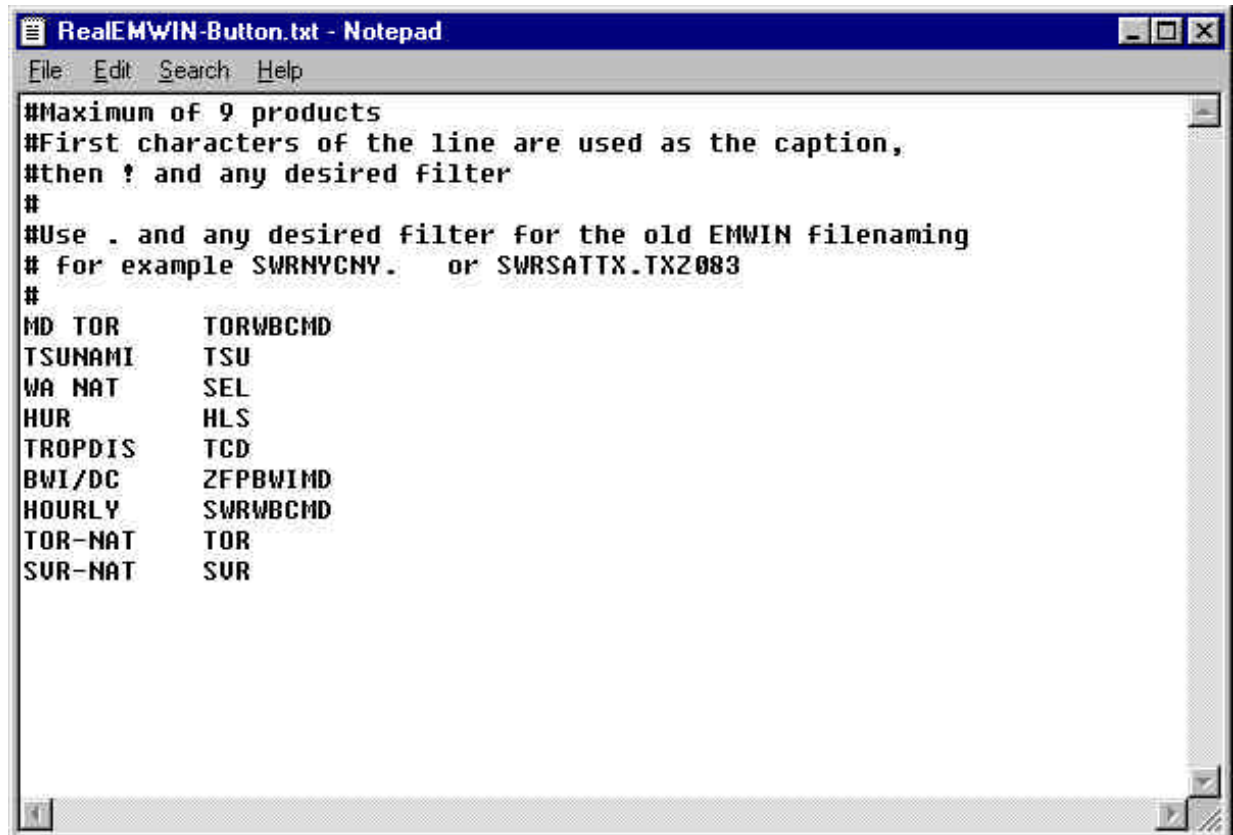
Figure 9 Alarm Configuration Window

- b. Delete all default products in the alarm area by highlighting in blue, right click the mouse, and select Delete.
- c. Confer with meteorology staff and decide which products to alarm (e.g., tornado warnings, flash flood warnings, etc.). For a list of product types, refer to Help in the RealEMWIN Operation window.
- d. Enter the EMWIN product name and the issuing office, such as **TORWBC**, in the **Product** box.
- e. Select the **State** such as **MD** using the down arrow in the state box.
- f. Check the **Scroll** box to enable the product to scroll across the bottom of the screen when detected.
- g. Check the **Log** box to enable logging of the product .
- h. Click on the **Add** button to add the product to the alarm queue.
- i. Continue adding products until done.
- j. Click on the **Exit** button when done.

3.9 Hot Buttons Configuration

Near the top of the RealEMWIN Operational window are a series of hot buttons. These buttons are programmable for displaying a maximum of nine products. The forecast office can use these buttons to quickly check if a tornado warning had been sent by the WFO. As soon as the button is activated, the product will be displayed. Suggestion is these buttons be programmed for quick display of issued watches and warnings.

- a. Use Windows Explorer search tool to locate **RealEMWIN-Button.txt**, a small file used for setting up hot buttons displays. The format of the text file is composed of nine character lines (see **Figure 10**). The first line represents the leftmost hot button on the RealEMWIN Window. The next line is the next right button and so on. The file shown in **Figure 10** allows the retrieval of products with the hot buttons called MD TOR, TSUNAMI, WA NAT, HUR, TROPDIS, BWI/DC, HOURLY, TOR-NAT, and SVR-NAT.



```
#Maximum of 9 products
#First characters of the line are used as the caption,
#then ! and any desired filter
#
#Use . and any desired filter for the old EMWIN filenaming
# for example SWRNYCNY. or SWRSATTX.TXZ083
#
MD TOR      TORWBCMD
TSUNAMI     TSU
WA NAT      SEL
HUR         HLS
TROPDIS     TCD
BWI/DC      ZFPBWIND
HOURLY      SWRWBCMD
TOR-NAT     TOR
SVR-NAT     SVR
```

Figure 10 RealEMWIN-Button.txt File

- b. Use the File/Edit to set up the buttons. The first eight characters are used as the caption for the button with spaces followed by a code of the product type, issuing office and state.

For the first button to be set up for tornado warnings from WBC enter as:

MD TOR TORWBCMD

MD TOR displays on the button

WBC MD is the issuing office

If more than one product is sent, the list box to the immediate left lists the products. Clicking on the products allows each one to be displayed.

- c. Save the file upon completion of editing the buttons for your particular use.
- d. Restart RealEMWIN for the file to be reloaded and changes to take effect.

4. MAINTENANCE

The site Electronic System Analyst (ESA) directs maintenance of this equipment as with any other equipment. The PC hardware is composed of COTS items.

4.1 Telephone Support

Zephyrus provides free telephone support for the installation and initial set up for a period of 30 days after the system is delivered and accepted at any location and phone support for a period of one year after expiration of warranty services for the WX-13 satellite receiver.

Hours of operation for phone support are 10:00 AM to 4PM Eastern time.
Telephone number is 918-437-3333.

For PC problems call Advance PC Products, 972-241-2774.
Refer to contract #50DDNW-0-9001 and have the computer serial number ready.
Hours of operation are 9 AM to 5 PM, Central time.

4.2 Replacements

Should any of this equipment fail, spares in limited quantities are available from NLSC. If not available, a comparable PC can be substituted, however it will be done at the expense of the site.

4.3 Hardware and Software Information

The antenna hardware, receiver, and LNA is available from Zephyrus after spares are exhausted.

Cable for the RF connection is standard RG-6. If a cable is found to be defective, a new cable can be readily made.

The remaining cables are COTS RS-232 cables.

L-band in-line amplifier (950 - 2050 MHz) part number ASK-LA9520 20 db gain.

4.4 Minimum Computer Specs

Speed/Type: 350 Mhz Pentium II with MMX or faster
Ram: 64Mb
Hard Disk: 2 GB or Higher
Case : Minitower
Graphic Card: Must be a minimum 4 MB, 3D
Cache: 256K
Floppy Drive: 3.5"

CD-Rom: Sound Blaster Compatible, Min. 16 Bit
Modem : 56 kBs
Monitor: Min. 28 dot pitch, 15 “

4.5 Software

- Digital Atmosphere Version 2.2
- RealEmwin Version 1.5
- Spinning Hat Software Cpager95
- Weathernode 4.0

4.6 Documentation

The following documentation will accompany each system:

- EMWIN Downlink Installation TIP
- Information and product literature on Antenna dish and computer.
- Software User's manuals

NOTE: The latest manuals for application packages can all be down loaded from the respective vendors via the Internet if more copies are needed. See the EMWIN vendor section of the EMWIN homepage (weather.gov).

5. LIMITED WARRANTY

Each system is warranted against faulty design, materials and workmanship for a period extending (1) year after site delivery. Should any defect develop within the warranty period, Zephyrus will replace or repair the defective component within three days of notification without expense to the government.

6. TROUBLESHOOTING

This system is quite simple to troubleshoot. Before beginning make sure all power and cabling is proper. Also make sure all other programs are working to eliminate possible computer problems.

Table 2 Troubleshooting

Symptom	Possible Causes
Yellow blocks in EMWIN Engine	<ul style="list-style-type: none">• Improper pointing angle• Incorrect polarity of feed• Interference from radiosonde• Faulty cable or cables• Faulty receiver• Faulty comm port 1• Receiver tone switch not in OFF position

Symptom	Possible Causes
Signal not acquired and receiver not locking	<ul style="list-style-type: none"> • Defective LNA • Defective receiver • Improper pointing angle • Incorrect polarity of feed • Interference from radiosonde • Defective cable or cables • Receiver tone switch not in OFF position • Faulty power supply
Intermittent loss of data	<ul style="list-style-type: none"> • Radiosonde interference • Defective LNA • Defective receiver • Moisture in LNA/RF connection • Incorrect polarity of feed.
Loss of data	<ul style="list-style-type: none"> • Antenna angle off due to wind moving it • Defective LNA • Defective receiver • Satellite signal missing due to eclipse period or actual failure at Wallops or EMWIN Headquarters • Defective RF cable or connection
Failure to alarm	<ul style="list-style-type: none"> • Error in product name or header • Error in alarm set up • Product not transmitted from EMWIN HQ

Attachment A
Site Latitudes and Longitudes

SITE ID	Name	STATE	LATITUDE	LONGITUDE
ABQ	Albuquerque	NM	35-02-13N	106-37-18W
ABR	Aberdeen	SD	45-27-21N	098-24-46W
AFG	Fairbanks	AK	64-51-35N	147-50-05W
AJK	Juneau	AK	58-22-42N	134-35-55W
AKQ	Wakefield	VA	36-59-01N	077-00-26W
ALY	Albany	NY	42-41-33N	073-49-57W
AMA	Amarillo	TX	35-13-59N	101-42-32W
APX	North Central Lower Michigan	MI	44-54-27N	084-43-08W
ARX	La Crosse	WI	43-49-22N	091-11-31W
BGM	Binghamton	NY	42-12-42N	075-59-10W
BIS	Bismarck	ND	46-46-19N	100-45-34W
BMX	Birmingham	AL	33-10-44N	086-46-56W
BOI	Boise	ID	43-34-02N	116-12-41W
BOU	Denver/Boulder	CO	40-00-00N	105-15-48W
BRO	Brownsville	TX	25-54-57N	097-25-07W
BTV	Burlington	VT	44-28-09N	073-09-20W
BUF	Buffalo	NY	42-56-29N	078-43-09W
BYZ	Billings	MT	45-45-03N	108-34-14W
CAE	Columbia,	SC	33-56-44N	081-07-21W
CAR	Caribou	ME	46-52-17N	068-01-04W
CHS	Charleston	SC	32-53-42N	080-01-39W
CLE	Cleveland	OH	41-24-44N	081-51-37W
CRP	Corpus Christi	TX	27-46-45N	097-30-22W
CTP	Central Pennsylvania	PA	40-47-29N	077-51-49W
CYS	Cheyenne	WY	41-09-07N	104-48-18W
DDC	Dodge City	KS	37-45-38N	099-58-07W
DLH	Duluth	MN	46-50-13N	092-12-37W
DMX	Des Moines	IA	41-44-10N	093-43-24W
DTX	Detroit	MI	42-41-13N	083-28-18W
DVN	Quad Cities	IA	41-36-42N	090-35-21W
EKA	Eureka	CA	40-48-36N	124-09-35W
EMWIN	Silver Spring	MD	38-50-34N	077-02-03W
EPZ	El Paso	NM	31-52-23N	106-41-53W

SITE ID	Name	STATE	LATITUDE	LONGITUDE
EWX	Austin/San Antonio	TX	29-42-15N	098-01-43W
EYW	Key West	FL	24-33-15N	081-45-15W
FGF	Eastern North Dakota	ND	47-55-19N	097-05-53W
FGZ	Flagstaff	AZ	35-13-48N	111-49-17W
FSD	Sioux Falls	SD	43-35-15N	096-43-46W
GGW	Glasgow	MT	48-12-24N	106-37-29W
GID	Hastings	NE	40-38-51N	098-23-04W
GJT	Grand Junction	CO	39-07-12N	108-31-28W
GLD	Goodland	KS	39-21-58N	101-42-03W
GRB	Green Bay	WI	44-29-55N	088-06-42W
GRR	Grand Rapids	MI	42-53-38N	085-32-41W
GSP	Greenville/Spartanburg	SC	34-54-00N	082-13-00W
GYX	Portland	ME	43-53-33N	070-15-18W
HGX	Houston/Galveston	TX	29-28-19N	095-04-46W
HNX	San Joaquin Valley	CA	36-18-50N	119-37-56W
ICT	Wichita	KS	37-39-18N	097-26-35W
ILM	Wilmington	NC	34-16-35N	077-54-46W
ILX	Central Illinois	IL	40-09-06N	089-20-18W
IND	Indianapolis	IN	39-42-23N	086-16-51W
IWX	Northern Indiana	IN	41-21-32N	085-42-00W
JAN	Jackson	MS	32-19-08N	090-04-49W
JAX	Jacksonville	FL	30-29-05N	081-42-06W
JKL	Jackson	KY	37-35-38N	083-19-02W
LBF	North Platte	NE	41-07-58N	100-42-00W
LCH	Lake Charles	LA	30-07-31N	093-12-59W
LKN	Elko	NV	40-51-36N	115-44-33W
LMK	Louisville	KY	38-06-53N	085-38-42W
LOT	Chicago	IL	41-36-15N	088-05-05W
LOX	Los Angeles	CA	34-12-26N	119-08-16W
LSX	St. Louis	MO	38-41-56N	090-40-58W
LUB	Lubbock	TX	33-31-42N	101-52-33W
LWX	Baltimore, MD/Washington, DC	VA	38-58-32N	077-28-38W
LZK	Little Rock	AR	34-50-05N	092-15-34W
MAF	Midland/Odessa	TX	31-56-33N	102-11-20W
MEG	Memphis	TN	35-07-51N	089-48-02W

SITE ID	Name	STATE	LATITUDE	LONGITUDE
MFL	Miami	FL	25-45-15N	080-23-02W
MFR	Medford	OR	42-22-37N	122-52-50W
MHX	Morehead City	NC	34-46-36N	076-52-37W
MKX	Milwaukee	WI	42-58-05N	088-32-57W
MLB	Melbourne	FL	28-06-49N	080-39-18W
MOB	Mobile	AL	30-40-46N	088-14-23W
MQT	Marquette	MI	46-31-53N	087-32-55W
MRX	Knoxville/Tri-Cities	TN	36-10-07N	083-24-06W
MSO	Missoula	MT	46-55-29N	114-05-25W
MTR	San Francisco Bay Area	CA	36-35-34N	121-51-20W
OAX	Omaha	NE	41-19-12N	096-22-00W
OHX	Nashville	TN	36-14-50N	086-33-45W
OKX	New York City	NY	40-51-56N	072-51-54W
OTX	Spokane	WA	47-40-51N	117-37-40W
OUN	Oklahoma City	OK	35-14-13N	097-27-39W
PAH	Paducah	KY	37-04-06N	088-46-19W
PBZ	Pittsburgh	PA	40-31-55N	080-13-05W
PDT	Pendleton	OR	45-41-27N	118-51-08W
PGUM	Guam	GU	13-28-40N	144-47-39E
PHFO	Honolulu	HI	21-18-10N	157-49-10W
PHI	Philadelphia	NJ	40-00-48N	074-49-03W
PHLI	Kauai	HI	21-51-02N	159-20-28W
PHOG	Maui, Kahului	HI	20-53-33N	156-26-13W
PHTO	Hilo	HI	19-43-20N	155-03-21W
PIH	Pocatello/Idaho Falls	ID	42-54-16N	112-35-23W
PSR	Phoenix	AZ	33-26-11N	112-01-26W
PUB	Pueblo	CO	38-16-47N	104-31-15W
RAH	Raleigh/Durham	NC	35-46-16N	078-40-52W
REV	Reno	NV	39-34-06N	119-47-48W
RIW	Riverton	WY	43-04-00N	108-28-36W
RLX	Charleston	WV	38-18-47N	081-43-07W
RNK	Roanoke	VA	37-12-15N	080-24-51W
SEW	Seattle/Tacoma	WA	47-41-14N	122-15-19W
SGF	Springfield	MO	37-14-06N	093-24-05W
SGX	San Diego	CA	32-55-05N	117-03-49W

SITE ID	Name	STATE	LATITUDE	LONGITUDE
SHV	Shreveport	LA	32-27-05N	093-50-29W
SJT	San Angelo	TX	31-22-16N	100-29-34W
SJU	San Juan	PR	18-26-05N	066-00-15W
TAE	Tallahassee	FL	30-23-38N	084-20-40W
TBW	Tampa Bay Area	FL	27-42-18N	082-24-07W
TFX	Great Falls	MT	47-27-35N	111-23-05W
TOP	Topeka	KS	39-04-20N	095-37-50W
TWC	Tucson	AZ	32-13-41N	110-57-19W
UNR	Rapid City	SD	44-04-22N	103-12-40W
VEF	Las Vegas	NV	36-02-48N	115-11-04W

draft

Attachment B
Azimuth and Elevation Approximation Pointing Angles

GOES 8 is at 75° Longitude and GOES 10 is 135°
(Elevations under 20 degrees are not recommended with small dish)

For your location “split the difference” relative to those listed.

***Polarity refers to the clock position of the feedhorn connector when the dish is viewed from the front.**

LOCATION	GOES 8 Elevation	GOES 8 Azimuth	*Polarity	GOES 10 Elevation	GOES 10 Azimuth	*Polarity
Washington State	20	126	1:00	34	194	11:30
Oregon	23	126	1:00	38	198	11:30
San Francisco	25	120	1:30	45	198	11:30
Los Angeles	30	122	1:30	47	205	11:15
Utah	31	132	1:30	39	211	11:15
Arizona	28	118	1:15	45	215	11:00
Minnesota	34	156	12:30	25	228	11:00
Kansas City	39	147	1:00	32	228	10:45
Dallas	46	146	1:00	35	234	10:30
Corpus Christi	49	139	1:15	40	236	10:30
Chicago	40	162	12:30	24	236	10:45
Nashville	47	162	12:30	26	240	10:30
New Orleans	52	154	12:45	32	242	10:45
New Hampshire	39	186	12:00	12	249	10:30
New York City	43	183	12:00	15	249	10:30
Washington DC	45	180	12:00	17	248	10:30
Orlando	57	169	12:15	25	250	10:00
Florida Keys	60	170	12:15	25	252	10:00